REMARKS

Claims 2-6 are pending in this application. By this Amendment, claim 2 is amended to correct a typographical error and to more accurately define the presently claimed subject matter. No new matter is added by this Amendment.

Entry of the amendments is proper under 37 C.F.R. §1.116 because the amendments: (a) place the application in condition for allowance (for the reasons discussed herein); (b) do not raise any new issue requiring further search and/or consideration (as the amendments merely revise the claims in an editorial manner without adding or deleting limitations); and (c) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented because the need for editorial revisions was only recently recognized. Entry of the amendments is thus respectfully requested.

The courtesies extended to the Applicants and Applicants' representatives by Examiner Zhu at the interview held April 15, 2008, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

I. Rejection under 35 U.S.C. §103(a)

Claims 2-6 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 5,702,540 ("Kubota") in view of U.S. Patent No. 4,191,599 ("Stickels"). This rejection is respectfully traversed.

The Patent Office alleges that it would have been obvious to one of ordinary skill in the art to have selected a pressure range within the disclosed pressure range of Kubota "because Kubota discloses the same utility over the entire disclosed range." See Final Rejection, page 3.

Furthermore, the Patent Office alleges that Stickels discloses that nitrogen is a result-effective variable because it directly affects nitrogen content, nitrogen penetration depth, and resulting residual stress on the steel's surface. See Final Rejection, page 3. Applicants respectfully disagree.

Kubota and Stickels would not have provided one of ordinary skill in the art with any reason or rationale to have modified the subject matter of Kubota and Stickels in a manner necessary to have achieved the process of claim 2. In particular, neither Kubota nor Stickels would have led one of ordinary skill in the art to a process wherein the active nitrogen carrier (e.g., ammonia) is (1) introduced into the vacuum furnace chamber during the preheating of the charge after the charge reaches at least 400 °C and (2) continuously introduced until the charge reaches the carburizing temperature, at which point the active nitrogen carrier is stopped and the carbon carrier introduction is begun.

As explained during the interview by Dr. Piotr Kula, the preheating stage comprises exposing the surface of the charge with nitrogen carrier before and separate from any exposure to a carbon carrier. The process achieves the result of restraining austenite grain growth on the surface of the charge during the high temperature carburizing process, while avoiding the formation of undesirable iron nitrides on the surface of the charge that were believed to result from the introduction of nitrogen prior to carburizing. See page 2 of the specification and Examples 1, 2, and 3.

Kubota describes that in a vacuum carburizing method, if a nitrogen carrier is used, it is introduced simultaneously with a carburizing gas. See Kubota, column 3, lines 30-33. Nowhere does Kubota describe introducing a nitrogen carrier before and separate from a carbon carrier, and only once the temperature of the charge reaches at least 400 °C.

Kubota thus fails to describe continuing both the introduction of the nitrogen carrier and the preheating until the temperature of the charge reaches a carburizing temperature, and

when the charge reaches the carburizing temperature, stopping the introducing of the active nitrogen carrier and starting the introducing of a carbon carrier into the vacuum furnace chamber. In fact, Kubota teaches away from this latter step, desiring the introduction of the nitrogen carrier and the carbon carrier together to effect carbonitriding.

Moreover, Stickels does not remedy the deficiencies of Kubota. Stickels also does not describe that the active nitrogen carrier (e.g., ammonia) is (1) introduced into the vacuum furnace chamber during the preheating of the charge after the charge reaches at least 400 °C and (2) continuously introduced until the charge reaches the carburizing temperature, where the active nitrogen carrier is stopped and the carbon carrier introduction is then begun, as recited in claim 2.

Stickels, at best, describes that "carbonitriding or nitriding while steel is in an austenitic condition, requires simultaneous control of both the carbon and nitrogen [carriers]," which is (1) frequently overdone, (2) difficult to accurately control and (3) disadvantageously results in high levels of retained austenite on the steel's surface. See Stickels, col. 1, lines 40-43 (emphasis added). In other words, Stickels also describes the simultaneous introduction of the nitrogen carrier and the carbon carrier, because "austenitic condition" refers to the fact that the steel charge has been exposed to a carbon carrier.

As such, Kubota and Stickels, alone or in combination, would not have provided one of the ordinary skill in the art with any reason or rationale (1) to continuously introduce an active nitrogen carrier during preheating from a temperature at least 400 °C to a carburizing temperature and/or (2) to shut off the active nitrogen carrier and introduce the carbon carrier when the charge reach the carburizing temperature such that the nitrogen carrier is introduced before and separate from the carbon carrier.

In the Office Action, the Patent Office alleged that the time and temperature the nitrogen carrier is introduced is a result effective variable, and thus it allegedly would have

been obvious to have optimized these variables to have derived the process of claim 2. Applicants strenuously disagree.

In particular, Applicants submit that the differences from Kubota and Stickels detailed above are such that routine optimization would not have resulted in the process of claim 2. One such difference is the fact that Kubota and Stickels both describe the simultaneous introduction of a nitrogen carrier and a carbon carrier for carbonitriding. The present claims, however, are not directed to optimizing the simultaneous introduction of a carbon carrier and a nitrogen carrier. Instead, the claimed process introduces a nitrogen carrier before and separate from a carbon carrier, and at completely different temperatures. These steps are not described or indicated possible or desirable in Kubota or Stickels, and thus these references would not have provided one of ordinary skill in the art with any reason or rationale to have derived the claimed process through optimization of the simultaneous introduction of a nitrogen carrier and a carbon carrier, as disclosed in Stickels and Kubota.

Further, one looking to achieve the carbonitriding described in Kubota would not have conducted a separate pre-nitriding, as such would have adversely affected the subsequent carburizing and would not have achieved a useful carbonitriding product. One would not have been led by Kubota and Stickels to the claimed process via any optimization for this further reason.

For the foregoing reasons, Applicants submit that Kubota and Stickels, alone or in combination, do not teach or suggest all of the features recited in claims 2-6. Reconsideration and withdrawal of the rejection are thus respectfully requested.

II. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 2-6 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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